

# **PENGARUH BIOFLOKULAN CANGKANG TELUR DAN *CATIONIC INDUCER* SENG KLORIDA TERHADAP EFEKTIVITAS PEMANENAN DAN KANDUNGAN METABOLIT PRIMER DARI *Chlorella vulgaris* SKALA LABORATORIUM**

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## **INTISARI**

Ketahanan pangan telah menjadi tantangan global. *Circular bioeconomy* dapat menjadi solusi bagi isu tersebut. *Chlorella vulgaris* merupakan mikroalga dengan potensi sebagai *novel sustainable superfood*, yang memproduksi biomassa ber kandungan metabolit primer baik bagi manusia. Flokulasi merupakan teknik pemanenan biomassa yang *cost-effective*, ramah lingkungan, inklusif, dan cepat. Cangkang telur adalah kontributor limbah yang berpotensi tinggi sebagai bioflokulan. Seng klorida merupakan *cationic inducer* efektif yang dapat meningkatkan flokulasi. Penambahan bioflokulan dan *cationic inducer* dapat berpengaruh terhadap kandungan metabolit primer. Maka dari itu, penelitian ini bertujuan untuk menguji pengaruh bioflokulan cangkang telur dan *cationic inducer* seng klorida pada *C. vulgaris*, berdasarkan efisiensi flokulasi dan kandungan metabolit primer. Sebagai perlakuan, 60 mg, 70 mg, dan 80 mg bioflokulan cangkang telur dikombinasikan dengan 75 mg dan 100 mg *cationic inducer* seng klorida di dalam 200 mL kultur. Perlakuan yang menunjukkan hasil efisiensi flokulasi paling efektif dan kurang efektif, serta kontrol kemudian melalui uji kandungan metabolit primer. Hasil dari penelitian ini menunjukkan bahwa bioflokulan cangkang telur dan *cationic inducer* seng klorida dengan rasio 60:75, 60:100, 70:75, 70:100, 80:75, dan 80:100 meningkatkan efisiensi flokulasi dan mempercepat *settling time*, dengan perbedaan tidak signifikan. Perlakuan 70:75 merupakan perlakuan paling efektif dengan efisiensi flokulasi  $95,377 \pm 1,494\%$ ; dan *settling time* seluruh perlakuan adalah pada sekitar menit ke-5. Perlakuan 70:75 menurunkan kandungan karbohidrat secara tidak signifikan tetapi menurunkan kandungan lipid dan meningkatkan kandungan protein secara signifikan dari *C. vulgaris*, sedangkan perlakuan (kurang efektif) 60:100 menurunkan seluruh kandungan metabolit primer secara signifikan dari *C. vulgaris*.

Kata kunci: bioflokulan, cangkang telur, *cationic inducer*, *Chlorella vulgaris*, metabolit primer, seng klorida

**THE EFFECTS OF EGGSHELL BIOFLOCCULANT AND  
ZINC CHLORIDE CATIONIC INDUCER TOWARDS  
HARVESTING EFFECTIVENESS AND PRIMARY  
METABOLITE CONTENT OF LABORATORY-SCALE  
*Chlorella vulgaris***

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**ABSTRACT**

Food security has become a global challenge. Circular bioeconomy can become a solution to this issue. *Chlorella vulgaris* is a microalga with the potential as a novel sustainable superfood, which produces biomass with good primary metabolites for humans. Flocculation is a cost-effective, environmental-friendly, inclusive, and quick biomass harvesting technique. Eggshells are waste contributors that have high potential as a bioflocculant. Zinc chloride is an effective cationic inducer that can enhance flocculation. Bioflocculant and cationic inducer addition can affect primary metabolite content. Thus, this research aims to examine the effects of eggshell bioflocculant and zinc chloride cationic inducer on *C. vulgaris* based on flocculation efficiency and primary metabolite content. As treatments, 60 mg, 70 mg, and 80 mg eggshell bioflocculants were combined with 75 mg and 100 mg zinc chloride cationic inducers in 200 mL of culture. Treatments showing the most and least effective flocculation efficiency results as well as the control then underwent primary metabolite content tests. The results demonstrated that eggshell bioflocculant and zinc chloride cationic inducer with 60:75, 60:100, 70:75, 70:100, 80:75, and 80:100 ratios increased flocculation efficiency and accelerated settling time, with non-significant differences. The 70:75 treatment was the most effective treatment with  $95,377 \pm 1,494\%$  flocculation efficiency; and the settling time for all treatments was approximately at the 5th minute. The 70:75 treatment non-significantly decreased the *C. vulgaris*'s carbohydrate content yet significantly decreased its lipid content and increased its protein content, while the 60:100 (least effective) treatment significantly decreased all primary metabolite content of the *C. vulgaris*.

**Keywords:** bioflocculant, cationic inducer, *Chlorella vulgaris*, eggshell, primary metabolite, zinc chloride